**C. Remarks**

In the office action, the drawings were objected to under 37 C.F.R. § 1.83(a) as failing to show every feature of the invention specified in the claims. Additionally, claims 1-14 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. Applicant respectfully traverses the objections and rejections as follows.

Claim Amendments

Applicant has herein amended the last step in each of dependent claims 4 and 5 to clarify that the recited "speed-setpoint characteristic" is the "speed-setpoint droop characteristic." This amendment is supported, for example, by paragraphs [0038] to [0039], as well as by steps 70e and 70f of Figure 3, of the application as filed. Applicant has additionally amended claims 10 and 14 to correct minor grammatical errors.

Drawing Objections Under 37 CFR § 1.83(a)

Applicant gratefully acknowledges the courtesies extended by Examiner Jiang during the telephone conference of November 13, 2006 with Applicant's undersigned representative. During the conference, Examiner Jiang stated that Applicant's comments as to why new drawings are not necessary may be submitted in the office action response in lieu of new drawings. Applicant's comments in that regard are as follows.

In the office action, the Examiner states that in order to comply with 37 C.F.R. § 1.83(a), the drawings must show the relationship between the ideal speed-temperature characteristics, the speed-setpoint droop characteristics, and the speed-temperature characteristics. For the same reason, the Examiner states that the

drawings must show the step of "computing a first fan speed output based on a comparison of the system temperature and the selected temperature [setpoint]."

Applicant acknowledges that under 37 CFR § 1.83(a), the drawings in a non-provisional application must show every feature of the invention specified in the claims. Applicant submits, however, that the relationship between the ideal speed-temperature characteristics, the speed-setpoint droop characteristics, and the speed-temperature characteristics is not a feature presently claimed in the application. Indeed, the Examiner has not identified a particular claim containing such a feature. Accordingly, Applicant submits that the relationship identified by the Examiner need not be shown in the drawings.

With respect to the step of computing a first fan speed output, Applicant submits that this step is not amenable to illustration in the manner suggested by the Examiner. As described in embodiments of the application, this computation may be performed within a microcontroller (such as the FCB microcontroller 18 of Figure 1) based on, for example, the error between the system temperature and the droop-compensated temperature setpoint. Furthermore, the details of this computation are not necessary for a proper understanding of the invention and, as discussed below in connection with Appendix C, are within the purview of one of ordinary skill in the art. For these reasons, Applicant submits that labeled boxes 72, 74 and 76 of Figure 3 (attached at Appendix A) show the step of computing a first fan speed in the manner required by 37 CFR § 1.83(a).

35 U.S.C. § 112 Enablement Rejections

Claims 4-5

The Examiner contends that claims 4 and 5 fail to comply with the enablement requirement. The only statement that the Examiner offers in support of this conclusion is that "[c]laims 4 and 5 recite the determining the speed characteristic. However, the speed-setpoint droop characteristics have not been adjusted after the first approximation of the speed-setpoint droop characteristics is defined."

The Examiner's statement is contradicted by the specification as filed. In particular, with reference Figure 4 attached at Appendix B, the adjustment to the speed-setpoint droop characteristic (step 70e) is clearly performed after the first approximation of the speed-setpoint droop characteristic (steps 70c and 70d). The order of these steps is further described in paragraphs [0036] to [0039]. Because the Examiner's conclusion regarding the lack of enablement for claims 4 and 5 lacks support, Applicant requests the withdrawal of the enablement rejection for claims 4 and 5.

Claims 1-4 and 6-14

The Examiner contends that claims 1-4 and 6-14 fail to comply with the enablement requirement. Specifically, the Examiner states that "illustrations of the computing a first fan speed output based on a comparison of the system temperature and the selected temperature [setpoint] must be shown on graphics such as fan-speed/temperature graphics to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention."

In order to make a proper rejection based on enablement, an examiner has the initial burden of establishing a reasonable basis to question the enablement provided for

the claimed invention. *See* MPEP § 2164.04 (citing *In re Wright*, 999 F.2d 1557, 1562, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993). In satisfying this burden, the examiner must: (1) explain why he doubts the truth or accuracy of any statement in a supporting disclosure; and (2) back up his own assertions with acceptable evidence or reasoning inconsistent with the contested statement. *See* MPEP § 2164.04 (citing *In re Marzocchi*, 439 F.2d 220, 224, 169 USPQ 367, 370 (CCPA 1971). Additionally, the examiner's explanation must always be supported with specific technical reasons.

In the present application, the Examiner offers no reason, technical or otherwise, as to why the absence of graphics illustrating "computing a first fan speed output based on a comparison of the system temperature and the selected temperature setpoint" renders the disclosure non-enabling. Clearly, given the requirements set forth in the MPEP and applicable case law, the Examiner has not discharged his burden to establish a *prima facie* case of non-enablement.

Notwithstanding the lack of support for the Examiner's non-enablement rejection, Applicant submits that the graphical illustrations described by the Examiner are not necessary for enablement, as the step of "computing a first fan speed output based on a comparison of the system temperature and the selected temperature setpoint" may be practiced by one skilled in the art without undue experimentation. In particular, Applicant notes that Microchip Technology, Inc., the manufacturer of the PIC16F876 microcontroller referenced on page 7 of the application, provides code examples of proportional integral derivative (PID) controllers for use with its microcontrollers on its website. *See* Appendix C. Using such code, Applicant submits that one skilled in the art would be able to implement the computational step referenced by the Examiner

without undue experimentation.

For at least the reasons set forth above, Applicant submits that the Examiner has not established a *prima facie* case of non-enablement with respect to any of claims 1-14. It is therefore requested that the rejection of these claims under § 112, second paragraph be withdrawn.

To aid the Examiner's understanding of the present invention, particularly the thermal control mode, Applicant provides the following comments:

The fan control module (FCM) 10 of Figure 1 may be operated in one of three modes: 1) automatic thermal control mode, 2) automatic voltage control mode, and 3) manual mode. When the automatic thermal control mode is selected, a modified temperature setpoint control scheme is used. Unlike a conventional temperature control scheme which uses a fixed temperature setpoint, the automatic thermal control mode of the present invention changes the temperature setpoint based on the measured speed of the fans 16a-c. Adjustment of the temperature setpoint in this manner, referred to as "droop" adjustment, avoids stability problems associated with conventional fixed-setpoint control schemes.

The flow diagram of Figure 3 illustrates an example of the automatic thermal control mode during operation. At step 66, fan speed is determined. At step 68, system temperature is determined. At step 70, a temperature setpoint based on the fan speed determined at step 66 is selected. The temperature setpoint may be selected using a look-up table stored within the microcontroller 18 and having a plurality of fan speed values and a corresponding plurality of temperature setpoint values. The look-up table values may be determined *a priori* in accordance with the method of Figure 4 discussed

below.

At step 72, after the temperature setpoint has been selected, fan speed may be controlled by comparing the system temperature from step 68 to the temperature setpoint selected at step 72. If the system temperature is higher than the selected temperature setpoint (indicating more airflow is needed), a new fan speed may be computed at step 74 such that fan speed is increased. Alternatively, if the system temperature is lower than the selected temperature setpoint (indicating less airflow is needed), a new fan speed may be computed at step 76 such that fan speed is decreased. As discussed above in connection with enablement, one skilled in the art will readily appreciate that the temperature control process represented by steps 72-76 may be implemented using a conventionally-coded PID control loop.

The flow diagram of Figure 4 illustrates an example of how the speed-setpoint droop characteristic (*e.g.,* the speed-setpoint values of the look-up table referenced at step 70 of Figure 3) may be empirically determined. At step 70a, a desired range of ambient temperature operation (e.g., 25-45°C) is selected. At step 70b, an ideal speed-temperature control response is defined by, for example, plotting a straight-line between a minimum speed-temperature endpoint and a maximum speed-temperature endpoint. These endpoints may be, for example, (25°C, 3300 RPM) and (45°C, 5700 RPM).

At steps 70c and 70d, a first approximation of the speed-setpoint droop characteristic is determined. This involves determining endpoints of the speed-setpoint droop characteristic, and then determining its intermediate data point values. At step 70c, the endpoints are empirically determined using a fixed-setpoint controller to determine temperature setpoints that correspond to the minimum speed-temperature

and maximum speed-temperature endpoints of the ideal speed-temperature control response. For example, the endpoint of (25°C, 3300 RPM) of the ideal response may correspond to a setpoint of 20°C, and the endpoint (45°C, 5700 RPM) of the ideal response may correspond to a setpoint of 40°C. Thus, the endpoints of the approximated speed-setpoint droop characteristic, according to this example, would be (3300 RPM, 20°C) and (5700 RPM, 40°C).

At step 70d, the intermediate data point values of the speed-setpoint droop characteristic may be determined using the fixed-setpoint controller to determine a temperature setpoint and corresponding fan speed for providing stable control at each of a plurality of temperatures over the ambient temperature range selected at step 70a. For example, a temperature setpoint and corresponding speed for providing stable control may be determined for each 1°C increment of ambient temperature between 25°C and 45°C. Based on this example, nineteen speed-setpoint data points may be determined corresponding to ambient temperatures 26°C, 27°C, ...44°C. The nineteen speed-setpoint data points, along with the endpoints determined at step 70c, collectively define the first approximation of the speed-setpoint droop characteristic.

At step 70e, the intermediate data points of the approximated speed-setpoint droop characteristic are adjusted to better approximate the ideal speed-temperature control response defined at step 70b. Adjustment is performed by comparing, for a given ambient temperature, the speed indicated by the ideal speed-temperature control response and the speed indicated by the speed-setpoint data point for that ambient temperature. For example, at an ambient temperature of 30°C, the ideal speed-temperature control response defined at step 70b in the example above indicates a fan

speed of 3900 RPM. The measured speed-setpoint data point corresponding to an ambient temperature of 30°C may be, for example, (4100 RPM, 27°C). Thus, the measured speed exceeds the ideal speed by 200 RPM. In order to make the measured fan speed better approximate the ideal fan speed, the temperature setpoint corresponding to the measured fan speed may be slightly increased (e.g., increased to 27.5°C). In this way, the fan speed at the same ambient temperature will be decreased during subsequent operation, thus decreasing the difference between the ideal and measured fan speeds. Alternatively, if the measured speed is less than the ideal speed for a given ambient temperature, the temperature setpoint corresponding to the measured fan speed may be slightly decreased so that the fan speed at the same ambient temperature will be increased during subsequent operation.

At step 70f, for each value of ambient temperature, the fan speeds corresponding to each temperature setpoint of the speed-setpoint droop characteristic (including the adjusted temperature setpoints) may be determined and, in step 70e, again compared to the ideal speed for the ambient temperature and further adjusted if necessary. This process of adjusting the setpoint at each ambient temperature and comparing its corresponding fan speed to the ideal fan speed may be performed iteratively such that the speeds of the speed-setpoint droop characteristic better approximate the ideal speed-temperature control response. The resulting speed-setpoint data points of the speed-setpoint droop characteristic may then be stored into a look-up table at step 70g for use as described above in connection with Figure 3.

**D. Conclusion**

Applicant respectfully requests a Notice of Allowance for the pending claims in the present application. If the Examiner is of the opinion that the present application is in condition for disposition other than allowance, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below in order that the Examiner's concerns may be expeditiously addressed.

Respectfully submitted,

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